

## ABSTRACT OF THE DISCLOSURE

Disclosed are methods and apparatus for characterizing a potential void or voids by analyzing the X-ray count of one or more emitted X-ray species as emitted from an interconnect structure under test in response to a impinging beam, such as an electron beam, directed towards the sample surface. For example, this analysis may be used to determine whether the structure (*e.g.*, a contact, line or via) has one or more void(s). It may also be used to help determine where the void(s) are with respect to the interconnect structure. It may also be used to help determine other characteristics of the void(s) with respect to the interconnect structure such as the shape(s) and size(s) of the void(s). The analysis may also be used to help initially determine whether the structure under test is so out of specification that it cannot then be determined whether the structure has a defect of a particular type. This analysis can be used to evaluate the process variation of wafers.